Ormaig Prehistoric Rock Art, Argyll

Archaeological Survey Report

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AOC Archaeology Group

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Archaeological Survey Report

On Behalf of:	**Archaeology Scotland** Suite 1a, Stuart House, Eskmills Station Road Musselburgh, EH21 7PB
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This document has been prepared in accordance with AOC standard operating procedures.

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Abstract

A laser scan survey was carried out at Ormaig prehistoric rock art in March 2014 for the purposes of conservation management. The survey was the second such survey to be carried out, with data collected in 2007 providing a baseline record to which the 2014 data was compared. Significant changes to the site were noted, largely due to moss and lichen growth over the exposures caused by the removal of forestry cover in the surrounding area.

Introduction & Background

1. In March 2014, laser scan surveys of the prehistoric rock art panels located at Ormaig, Argyll (NGR: NM 8222 0270; NMRS: NM80SW 8) were carried out for the purposes of recording and condition monitoring. Ormaig is well known as one of the most spectacular examples of Scottish prehistoric rock art, comprising eight exposures of incised cups, rings, parallel lines and other geometric designs.

2. The site was the focus of attention in 2007, when excavations were carried out by Kilmartin House in order to establish the full extent of the visible exposures, and at that time a laser scan survey was carried out by AOC Archaeology Group, an experimental programme with the aim of assessing the suitability of laser scanning techniques for recording and monitoring rock art. Working with RCAHMS, a range of laser scanning and photogrammetric techniques were used to record the panels, and an assessment of the efficacy of each was made (see Cavers et al 2008). The conclusion of that study was that laser scanning undoubtedly provides the highest-quality data, but that practicalities of acquiring laser scan data in remote field locations (i.e. involving generators, laptops and non-waterproof scanners) mean that in many instances a photogrammetric approach is more suitable, with the trade-off in data quality an acceptable compromise for field survey of rock art (see also Chandler et al 2007).

3. The current project however, aimed to investigate the potential for comparison analysis between datasets collected several years apart, and for the detection of erosion or damage to the exposed panels of rock art. For this reason, the site was re-scanned in 2014 in order to provide comparable direct-measurement data.

Methodology

4. In order to provide high-resolution scan data comparable to that acquired in 2007, a Faro Platinum Arm with laser line probe was used to scan exposures 1 South, 1 North and about 66% of exposure 2. The Faro arm system is a high-accuracy laser scanner, capable of acquiring high-accuracy data at sub-mm level. Laser scan data was collected at better than 0.5mm resolution for each of the areas scanned. Sub-mm laser scanning systems are typically susceptible to variable exposure conditions, with strong lighting a particular problem; during the 2014 a lightweight tent was used to provide shade for the scanning operations.

5. Laser scan data was processed and registered using Geomagic, with cleaned meshes produced in Geomagic and Trimble Realworks, and rendered in Blender 2.70.

   In addition to the laser scan data, photogrammetric data was acquired using a Canon DSLR and processed to geometric meshes using Agisoft Photoscan. The photogrammetric meshes, while lower resolutions, provide a valuable additional source for illustration, and are comparatively easy to produce, requiring much less processing than laser scanned data.

General Observations

6. Since 2007 the commercial conifer plantation surrounding the Ormaig site has been removed, so that the site is now open. The removal of trees from the site has resulted in dramatic changes, although the implication of these changes for the site are not clear. The open exposure of the rock panels has resulted in considerable lichen and moss growth over the panels, to the extent that some carvings are now completely in-filled by moss growth (see Figure 1 and 2). From initial field observation it is difficult to be certain whether the growth of moss is necessarily having a detrimental effect on the carvings: this warrants further study.

7. The presence of significant moss growth has had a direct effect on the results of the laser scan survey, however. Very black lichens meant that it was difficult to obtain a good response from the laser during scanning, with the consequence that data voids were unavoidable. In addition, the presence of moss and lichen growth caused difficulties in carrying out cloud-cloud registration between the 2007 and 2014 datasets, meaning that comparison has only been possible in a few key areas.

Assessment of the data

8. The laser scan data collected during the 2014 survey provides a useful comparison to that collected in 2007. However, the changes that have occurred on the site have created some limitations in the comparison analysis, while the growth of dark lichens and mosses have caused unavoidable data voids in some areas. Hole filling and mesh cleaning procedures were applied to the data in order to produce Figures 4 to 6. Unfortunately, the highly variable colour and texture of the rock art panels in their current state means that it is difficult to acquire clean scans of the exposed surfaces. In some areas, such as the nineteenth-century graffiti on Exposure 1 North, carvings which were very clear in 2007 are now almost invisible due to the growth of moss in the incised areas.

9. Surface-to-surface comparison analysis of the 2007 and 2014 datasets was carried out, although this was seriously compromised by the growth of moss and lichen, meaning that poor registration quality was achieved between the datasets and in the areas tested, differences were attributable to vegetation growth and the effect of this on the scan comparison. Nonetheless, useful comparisons between the 2007 and 2014 datasets have been possible. On Exposure 1 South, the 'rosette' carving shows some evidence of variation in the ring depth of up to 1mm (see Figure 7). On exposure 1 North and exposure 2, the areas tested showed variation across the scan data of up to 3mm in places, although this seems likely to be attributable to the effect of lichen growth on the registration of surfaces between years (Figure 8 and 9).

10. The acquisition of high-quality data via photogrammetry was very successful, with the varied exposure and texture caused by the lichen growth in fact aiding the production of high-density photogrammetric cloud data (e.g. Figures 10 to 17).

Discussion

11. Recent advances in the efficiency of 3D data processing software and computer processing power have meant that the management of very large dataset such as those required to represent laser scans of rock art panels has become very much easier. However, the survey of rock art panels using laser scanners is always likely to be challenging, since most sub-mm systems require a generator for power and a tethered, high-specification laptop. In contrast, photogrammetry requires only a camera on site, with the required data collected within a very short space of time. The compromise in data quality when using photogrammetry in preference to laser scanning means that monitoring of changes in the rock faces at millimetric level are unlikely to be possible (discussion by Cavers et al 2008), but as the comparison analysis carried out here has shown, this may always be difficult to do since changes in lichen and moss growth can easily mask real changes in the rock itself.

Condition monitoring at Ormaig

12. The removal of forestry from the area surrounding the panels has clearly had a dramatic effect on the exposed rock art panels. It is not possible on the basis of this survey to confirm whether the presence of moss and lichen constitutes a significant detrimental effect on the panels, and specialist advice would be required in order to establish this. However, new seedling trees are colonising the area around the panels, and it will be necessary to monitor the site in future to ensure that these new trees do not cause damage to the rock faces.

References

Bryan, P.G & Chandler J.H, 2008. Cost-Effective Rock-Art Recording within a Non-Specialist Environment, Proceedings of ISPRS 2008, Beijing, China

Cavers, M.G., Hepher, J. and Hale, A. 2008 'A comparison of laser scanning and photogrammetric techniques used to record rock art at Ormaig, Argyll, Scotland', *6th World Archaeology Congress (WAC6), Dublin*

Chandler, J.H., P. Bryan, & J.G. Fryer. 2007. The development and application of a simple methodology for recording rock art using consumer-grade digital cameras. The Photogrammetric Record. 22(117): 10-21.

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Section 2: Figures and Plates

Figure 1: Exposure 1 South, viewed from the east in 2007, prior to removal of forestry.

Figure 2: Exposure 1 South, viewed from the east in 2014, after removal of the forestry.

Figure 3: Laser scanning in progress at Exposure 1 south.

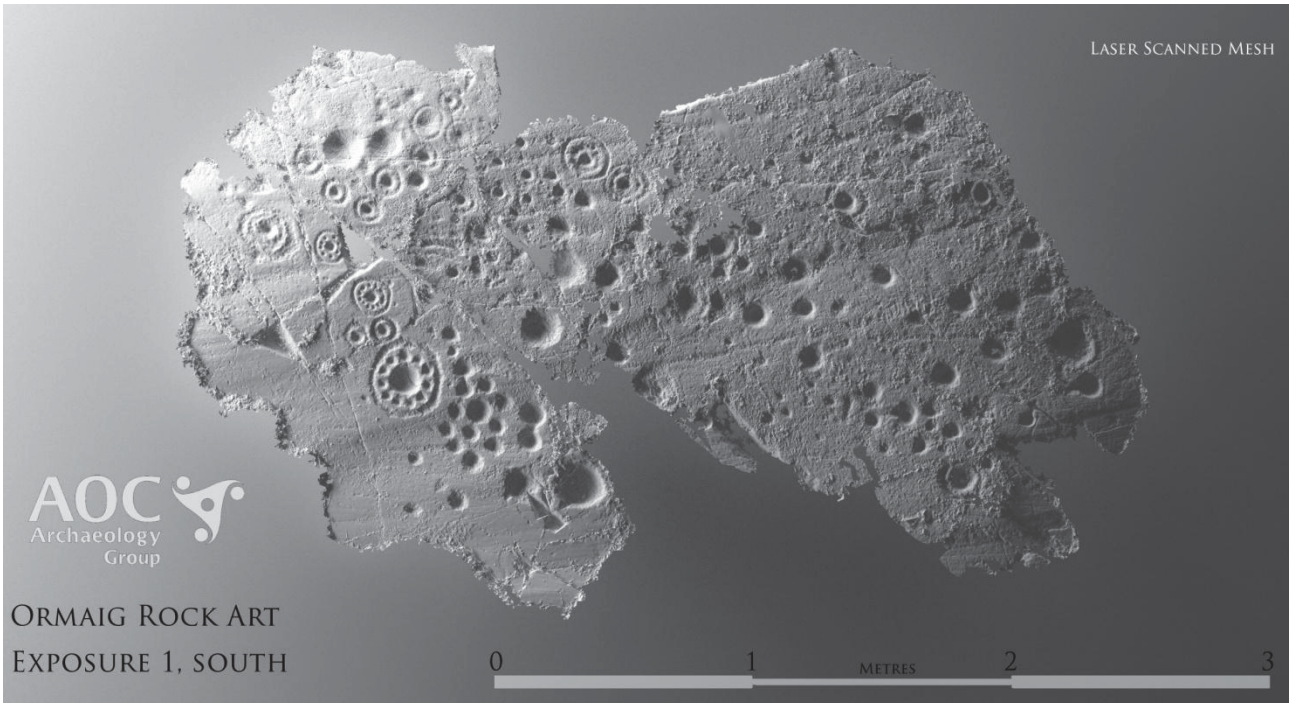

Figure 4: Exposure 1 South, laser scanned mesh illuminated from top left

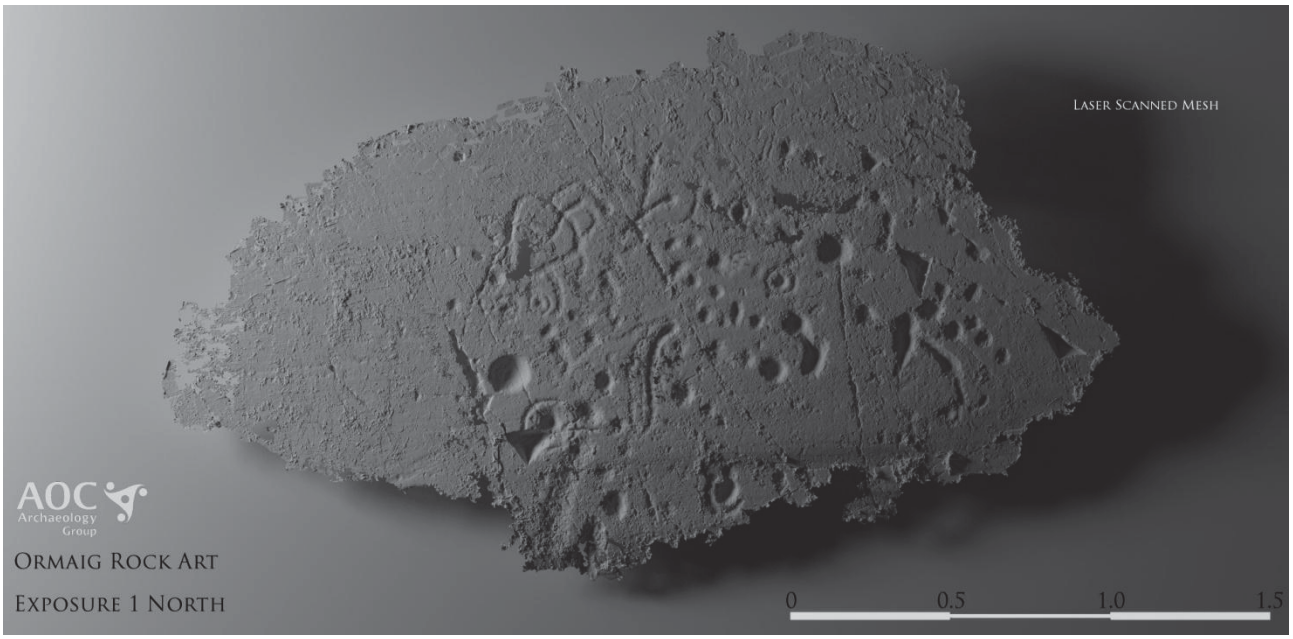

Figure 5: Exposure 1 North, laser scanned mesh illuminated from the top left

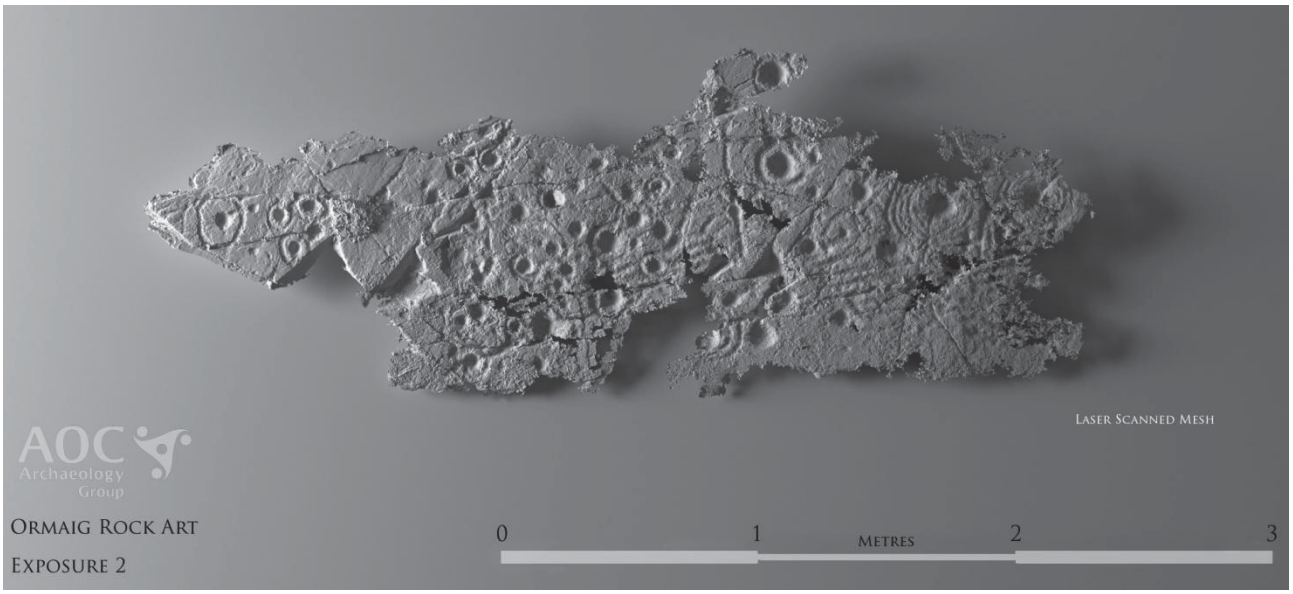

Figure 6: Exposure 2, laser scanned mesh illuminated from the top left

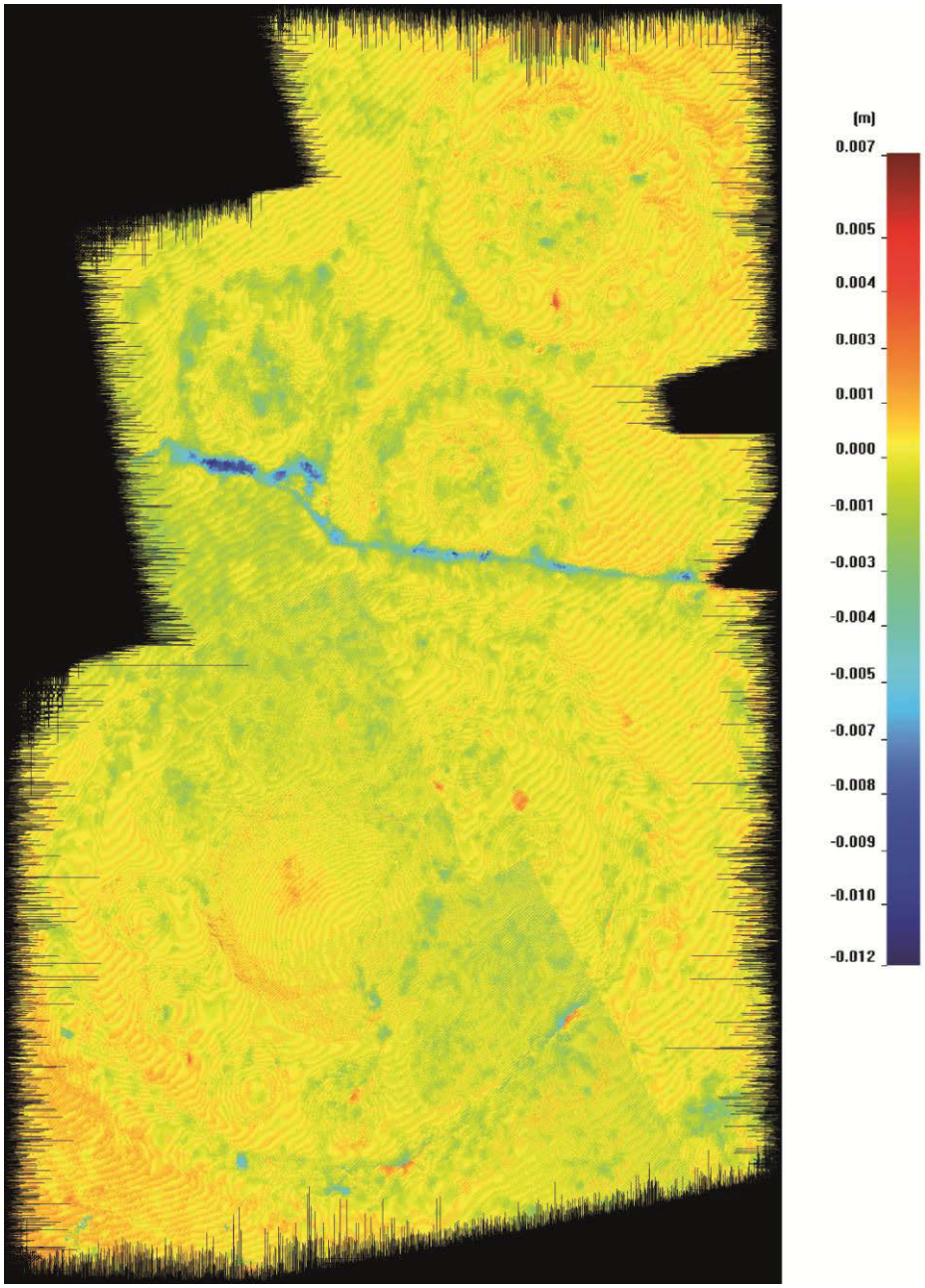

Figure 7: Surface-to-surface inspection map between 2007 laser scan data and 2014 data, showing some differences in cup and ring depth in the smaller cups

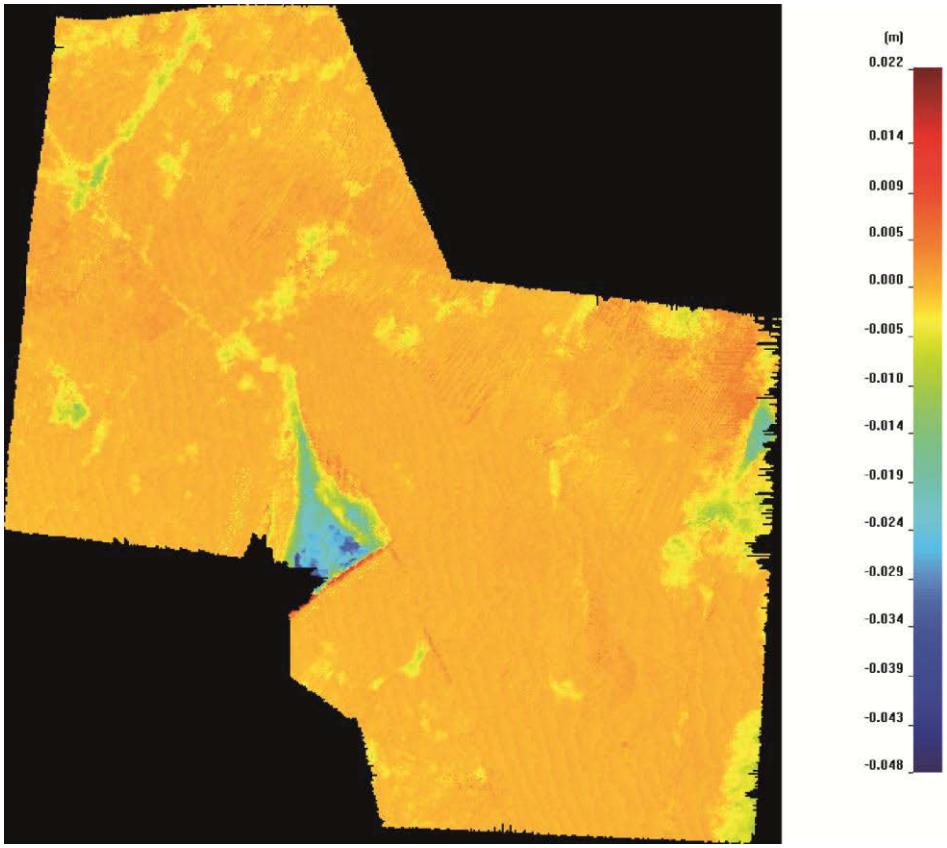

Figure 8: Surface-to-surface inspection map between 2007 laser scan data and 2014 laser scan data, Exposure 1 N

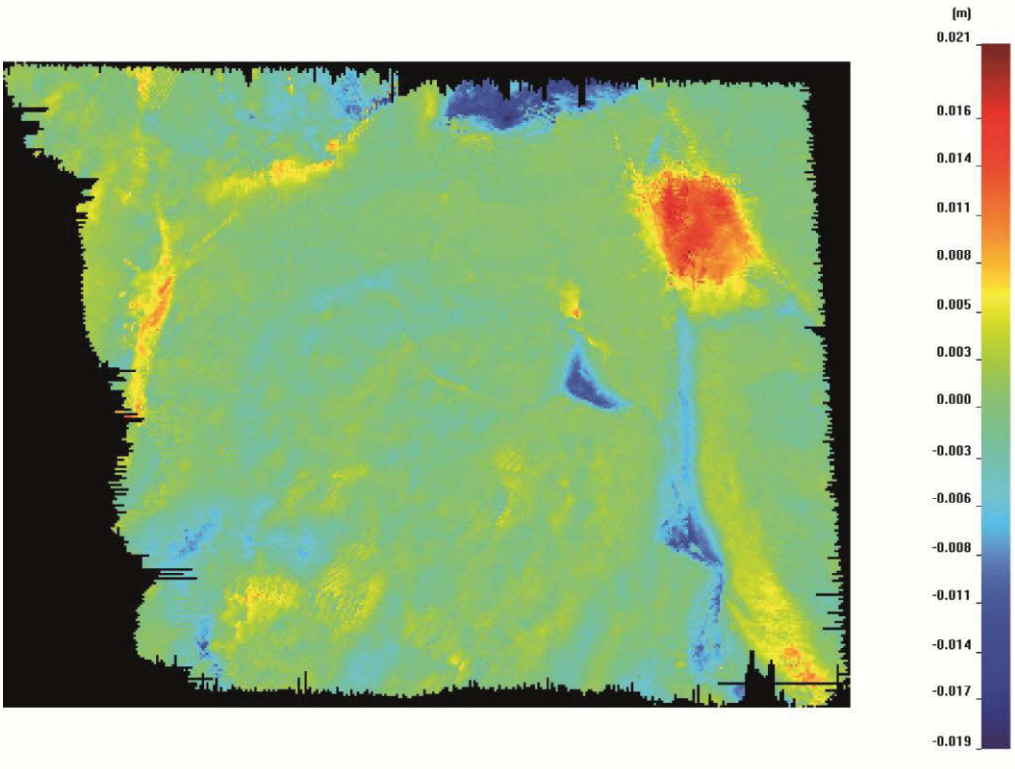

Figure 9: Surface-to-surface inspection map between 2007 and 2014 data, Exposure 2

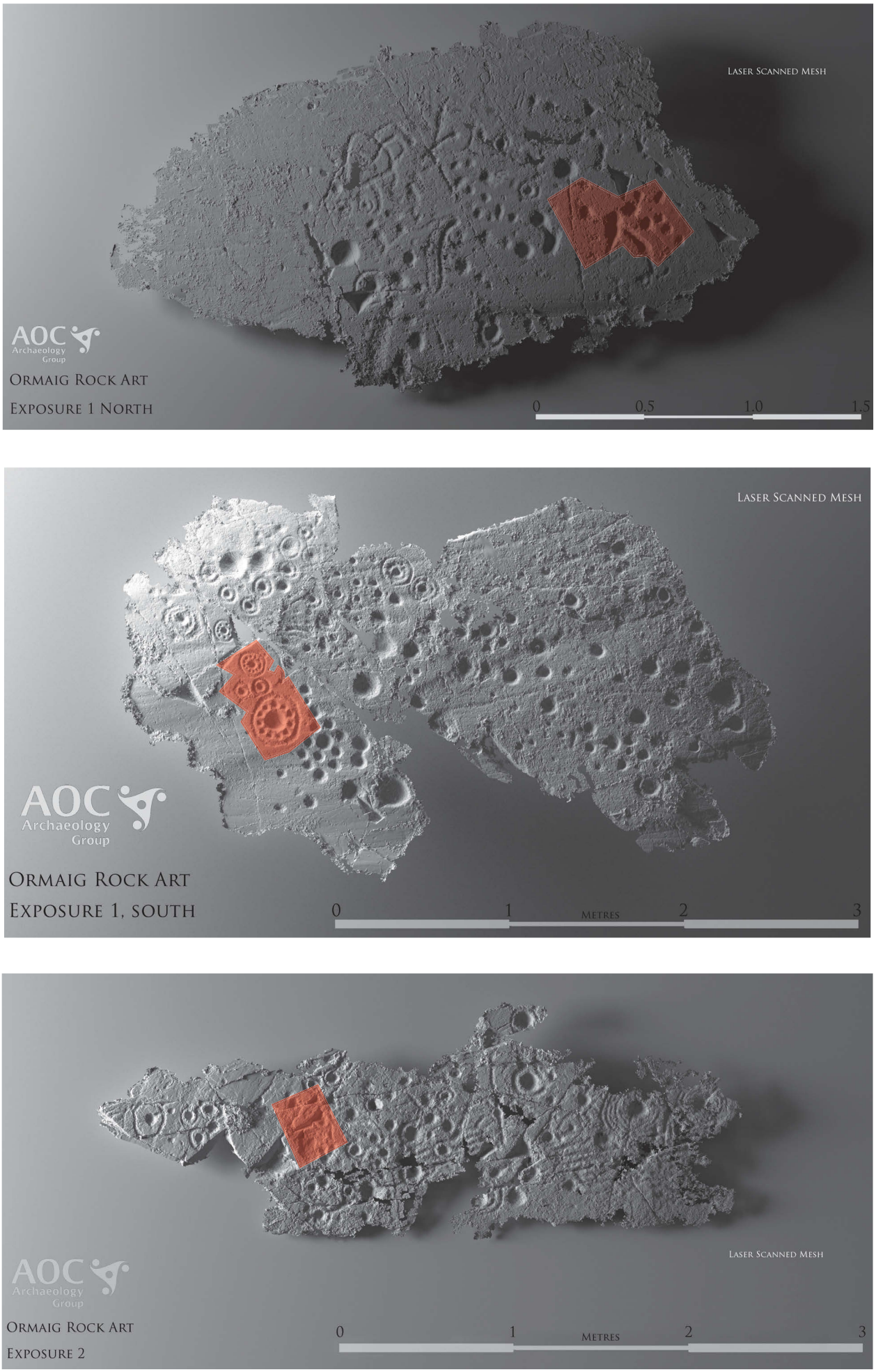

Figure 10: Surface-to-surface inspection map locations (Figures 7, 8 and 9)










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